

Bago University
Department of Chemistry
First Semester Examination, March 2019

Third Year BSc
(Chemistry Specialization)
Answer any six Questions

Chem-3104
Analytical Chemistry I
Time Allowed: (3) hours

1. (a) Fill in the blanks with the correct word(s), unit(s), and etc., as necessary.
 - (i) The initial rate of precipitation is proportional to the ———.
 - (ii) Particles with diameters of about 10^{-7} to 10^{-4} cm are said to be ———.
 - (iii) A colloid that has only a small affinity for water is called a ———
 - (iv) Adsorbed impurities can be removed by ——— unless they are occluded.
 - (v) When the sample is mixed with an alkali metal salt, called the ———.
 - (vi) 4.548×10^3 has ——— significant digits.
- (b) Select the correct statement(s), word(s), unit(s) and etc., given in the followings.
 - (i) Particles with diameters of about (0.1 μm to 1 μm , 0.1 μm , 1 to 1000 nm) are said to be colloids.
 - (ii) Ostwald ripening is useful for increasing particle size of (crystalline precipitates, curdy precipitates, gelatinous precipitates).
 - (iii) The process of dispersing an insoluble material into a liquid as a colloid is called (nucleation, peptization, coagulation).
 - (iv) (Sorbed, Adsorbed, Occluded) water is a type of nonessential water that is retained on the surface of solids.
 - (v) The difference between the true value and the measured value, with regard to the sign, is the (absolute, relative, random) error.
 - (vi) The symbol \bar{d} is denoted as (deviation, standard deviation, average deviation).
2. (a) What are the sources of errors encountered in decomposition and dissolution?
(b) Differentiate between (i) sorbed water, adsorbed water and occluded water
(ii) essential water and non-essential water (iii) water of crystallization and water of constitution.
3. (a) Describe a sequence of steps involved in a quantitative analysis.
(b) Any choice of methods for the analysis involves a clear definition of the analytical problem. Explain briefly.
4. (a) Replicate water samples are analyzed for water hardness with the following results: 102.2, 102.8, 103.1 and 102.3 ppm CaCO_3 . Calculate (i) the standard deviation and (ii) the relative standard deviation.
(b) What are the general rules for determining number of significant figures?

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5. (a) Calculate the solubility product for barium sulphate, given that the solubility of BaSO_4 at 25°C in pure water is 2.23 mg per dm^3 .
(molar mass of $\text{BaSO}_4 = 233.34 \text{ g mol}^{-1}$)
- (b) Explain the meaning of the following terms.
(i) Absolute uncertainty (ii) Accuracy (iii) Precision
6. (a) Discuss the requirements for precipitation titration.
- (b) The arsenic in a 11.03 g sample of pesticide was converted to AsO_4^{3-} and precipitated as Ag_3AsO_4 with 50.00 cm^3 of 0.02015 M AgNO_3 . The excess Ag^+ was then titrated with 4.75 cm^3 of 0.04321 M KSCN . Calculate the percentage of As_2O_3 in the sample.
(molar mass of $\text{As}_2\text{O}_3 = 198.4 \text{ g mol}^{-1}$)
7. (a) Describe some limitations for precipitation.
- (b) The concentration of the chromate ion in 50 cm^3 of 0.1 F NaCl solution is 0.01 M . If the solution is titrated with 0.1 F AgNO_3 to the formation of a precipitate of silver chromate, what is (i) the value of $p\text{Cl}$ when silver chromate starts to precipitate and (ii) the error in the titration?
(K_{sp} of $\text{Ag}_2\text{CrO}_4 = 2 \times 10^{-2}$, K_{sp} of $\text{AgCl} = 1 \times 10^{-10}$)
